

XII. *The Rein-sheath in Plebeiid Blues: a correction of and addition to Paper VI.* By T. A. CHAPMAN, M.D., F.Z.S.

[Read October 4th, 1916.]

PLATES LXXV-LXXIX.

THE last paragraph of my paper on "The Pairing of the Plebeiid Blue Butterflies" contains one very confident but quite erroneous statement, that I desire to correct.

The material I was dealing with was scanty, and I did not know how to obtain any additional supplies. I was, however, so dissatisfied with the position in which I had left the matter, that I determined to follow it further.

I am now able to say something definite, and I hope correct, about the remarkable structure referred to. As a matter of fact, the sheath does consist of scales, but scales of such curious form and disposition that I am not prepared, whatever others may be, to blame myself severely for failing to recognise them as such, having preserved only two or three specimens.

The sheath, then, consists of scales, whose points of attachment are the "points" with which the surface of the rein is studded. These points are very small, quite unlike the usual sockets from which scales usually arise, but more like, as I described them, the traces of abortive hairs or scales. They must be the points of origin of the scales of which the sheath consists, but from which the scales so readily separate that it may be doubted whether they are at all attached to them, after the butterfly has emerged from the pupa. The scales are of a very unusual nature. The end, by which each was presumably attached to the surface of the rein, tapers to a point, that looks rather like a distal than a proximal end. The body of the scale is so curled and twisted as to be difficult to make out as to size or form; the distal end appears to be rounded. The twistings and curlings of neighbouring scales are so intertwined, as to obscure each other, and are the means that hold the scales together to form a cylinder.

The sheath is easily broken up, but into groups of scales, and separate scales are not easy to demonstrate. It is of elliptic section, its width being rather greater than is its dorso-ventral diameter.

The butterfly possesses this cylinder on emerging from the pupa, and appears to lose it as soon as pairing is over. One captured *in cop.* almost always still possesses it, but one taken otherwise very rarely, showing that the females of these butterflies, like those of so many Lepidoptera, remain quiescent and are rarely seen till pairing has taken place. The cylinder is so easily lost that it seems doubtful whether it retains any coherence by the scale attachments, and unless one is especially careful, it is more likely than not to be lost in preparing and mounting a specimen that still possesses it.

I have certainly several times, I fancy frequently, seen specimens *in cop.* in which the female did not possess the sheath. These may have been second pairings, or the sheath may have been lost before the first pairing.

The use of this structure probably is to give rigidity and support to the soft structure of the rein in finding its way to the base of the male genital cavity, and to maintain it in position, with some fixity, with the terminal plate in apposition with the aedeagus, so that penetration may take place. How this exact apposition was secured seemed to be rather puzzling, notwithstanding that the rein when full of fluid could be fairly rigid; but this did not explain how the correct position could be secured so rapidly as in fact it is, the actual pairing being apparently a matter of a second or two. The sheath must occupy with great accuracy the male genital cavity, so that the parts properly coincide.

The special character of the "furca" in the floor of the male genital cavity, appearing to support nothing nor attach any parts together, is probably related to the rein and its sheath. The rein (and sheath) would arrive at once in a position supported on each side by the branches of the fork, and resting in the hollow between them, filling the genital cavity so that the end of the sheath necessarily impinges against the short exposed portion of the aedeagus, and with the knee-like angle between the prop and the rein, at the base of the clasps. Though, no doubt, the difference in details of structure in the different species make this only a general description of the adaptation.

A question to which I cannot suggest an answer is, Why should it be lost so soon as pairing is over? It is no longer of any use, but is it now in any way injurious?

Its absence may give more room for the movement of the eggs to the ovipositor, and greater freedom to the actions of the structures involved in the important process of the fertilisation of each ovum.

The sheath in *coridon* is 2 mm. in length, 0.5 from back to front, and 0.7 from side to side. It looks as if constructed of a confused congeries of smooth rounded waves, each ending distally, however, in sharp rounded ends, which are the ends of the actual scales; these have no terminal teeth nor any striations. Each scale is curiously twisted, so that it is difficult to say what its size and outline would be, if it could be flattened out; but it is approximately 0.4 to 0.6 mm. long, 0.1 to 0.15 mm. wide at one-third from the free end, tapering fairly regularly to the attached point; it has a granular appearance, no striations as ordinary scales or rows of elevations like androconia. The granulations seem to be rather contents of the scale than structure of its walls. Various items of these details will be more easily grasped by reference to the Plates.

In *coridon* the sheath is tolerably cylindrical in form, but the two extremities are a little oblique to the main axis. In *bellargus* it is rather flattened in dorso-ventral diameter, more especially distally, where it is rather widened from side to side, giving it an appearance of a waist with spathulate extremity. In *icarus* it is rather expanded basally, narrows slightly towards the end, where it finishes with a more rapid, somewhat conical narrowing. *Astrarche* presents a form very similar to that of *icarus*. The difference between *coridon* and *bellargus* is less than my description perhaps implies; the sheath in *bellargus* could certainly not be described as cylindrical, but that of *coridon* has a slight terminal flattening, that could hardly however be called spathulate.

I have verified the presence of the sheath in *astrarche*, *icarus*, *coridon*, *bellargus*, *eversmanni*, *argyrognomon* and *damon*. Further research will probably demonstrate its presence in all these Plebeïids, but it seemed so desirable to make this correction to my paper as early as possible that I have not waited to carry the matter further.

This scale cylinder is, in itself, as remarkable as the

specialisation otherwise of these blues described in my paper, and is, of course, a detail of that specialisation. I am not aware that any similar structure has heretofore been observed.

EXPLANATION OF PLATES LXXV-LXXIX.

- PLATE LXXV. Two specimens of *A. bellargus* (*thetis*), side view, the prop and rein, clothed in the sheath, extended. $\times 10$. A. E. Tonge, photo.
- PLATE LXXVI. FIG. 1. Sheath of one of the specimens in last plate. $\times 30$. A. E. Tonge, photo. Mr. Tonge says that the blurring is due to passing traffic when photographing.
FIG. 2. Rein sheath of *A. coridon* separated (it separates almost too easily). $\times 25$. (Clark.)
- PLATE LXXVII. Rein of *P. icarus* with sheath broken into upper and lower halves. $\times 25$, and lower half of sheath. $\times 70$.
- PLATE LXXVIII. Portions of broken-up sheath of *A. coridon*. $\times 35$ and $\times 100$. This illustrates how the scales are intertwined and the difficulty of in any way separating out a single scale.
- PLATE LXXIX. Rein-sheath of *A. coridon*, nearest approach to separate (and unbroken) scales. $\times 200$.